REMARKS

The application has been amended and is believed to be in condition for allowance. This amendment replaces the unentered amendment of November 29, 2004, which amendment should remain unentered.

Claims 10 and 13-21 are pending.

The Official Action objected to the disclosure in that the use of the term "Ra" was unclear. An additional annex is included with this amendment, i.e., pages 102-103 of Principles and Applications of Tribolgy (cover and copyright page included).

Ra surface roughness is well known and recognized for quantifying the relative roughness of a surface. Indeed, the dimensional unit of surface roughness is meter (m), or, more convenient, micrometer (μm). Ra surface roughness is an ISO-standard method of measurement. It is important to specify this since the actual value of the surface roughness depends on the method by which the surface roughness is measured/determined.

The Principles and Applications of Tribology annex shows that there is a standardized, prescribed by ANSI and ISO, method for making the Ra surface roughness measurement. See pages 102-103 of this annex.

In the present specification, the term "Ra" thus denotes that the respectively concerned surface roughness is determined in accordance with the Ra surface roughness ISO-standard. For example, "the saddle surface has a Ra surface

roughness of 0.2 µm" or "the Ra surface roughness of the saddle surface is 0.2 µm".

Also see the attached annex from the ASM handbook, Volume 18, page 893, Ra expresses surface roughness in terms of arithmetic average (page 893 is attached).

Specification page 5, lines 10-12 shows how the Ra measurement is expressed, e.g., "the roughening value of the surface profiling lies between 0.30 and 0.75 µm Ra, …". That is, the roughening value of the surface profiling lies between 0.30 and 0.75 µm ***as expressed in terms of the Ra surface roughness ISO-standard***.

The specification uses other "Ra-parameters", i.e., Ra', Ras and Rar; these denote a respective parameter also ***as expressed in terms of the Ra surface roughness ISO-standard***, i.e., the combined roughness Ra' ***as expressed in terms of the Ra surface roughness ISO-standard***, carrier contacting face roughness Ras ***as expressed in terms of the Ra surface roughness ISO-standard***, and the carrier inner contact face roughness Rar ***as expressed in terms of the Ra surface roughness ISO-standard***.

The claims have been amended to make this explicit.

The specification at page 6 has been amended to resolve the formal issue raised by the Official Action.

Claim 15 has been amended to correct a typo and be consistent with equation (1) found on specification page 5.

In view of the above, reconsideration and withdrawal of the specification objections are respectfully requested.

Claim 14 was indicated to be of improper dependent form. Note that both claims 13 and 14 depend directly from claim 10. Claim 14 does not depend from claim 13. Accordingly, no amendment is believed necessary.

Claims 15, 10, 13-14, and 17-21 stand rejected as obvious over JP (60-95234), hereinafter JP '234.

Claim 16 stands rejected as obvious over JP '234 in view of HENDRIKS 4,332,575.

In General

In general, applicants' previous comments concerning HENDRICKS apply to JP '234.

Both references teach the general condition of the interaction/friction between adjacent bands in the carrier. Neither reference teaches optimizing the interaction/friction between the inner surface of the innermost band and the saddle of the elements.

Claim 15

As to claim 15, there is recited that i) a carrier contacting face of each transverse element and ii) an inner contact face (2) of the innermost endless band, contacting the carrier contacting face of each transverse element, have two characteristics, namely:

I) a combined roughness Ra' that is more than 0.6 µm Ra, and

II) the roughness of the carrier inner contact face (2) is larger than 0.8 µm Ra.

The claim defines the combined roughness Ra' as:

$Ra' = SQRT\ (Ras^2 + Rar^2)$,

Ras being the average roughness parameter of the carrier contacting face of each transverse element expressed in terms of the Ra surface roughness ISO-standard, and

Rar being the average roughness of the carrier inner contact face of the innermost endless band expressed in terms of the Ra surface roughness ISO-standard.

JP '234

As to JP '234, there is disclosed in the translated Constitution that "the surface-roughness of either of the inner and outer peripheral surfaces of both surface of the endless metallic belts are made steppedly coarse from either the metallic belt 4e [the innermost belt] or 4d [the belt adjacent the

innermost belt] to the outermost layer metallic belt 4a so that the relative positional movement among metallic belts 4a through 4e is restrained, thereby the centering effect may be obtained."

Thus, JP '234 concerns the interaction between the bands of the carrier, i.e., "... by restraining relative movement between the belts ..."; "... from [either] the metallic belt [4e or] 4d to the outermost layer metallic belt 4a...". The disclosure is only of the general condition of "coarse" surface roughness to be applied in the contact between the belts/bands of the carrier. Note that HENDRICKS discloses an optimum range therefor.

However, from this, the Official Action states that there is a disclosure of "the innermost endless belt band (4e) having a coarse inner surface in contact with the saddle face of the element (5).".

It is acknowledged that the two specific characteristics identified immediately above are not disclosed by JP '234.

The Official Action states that the recited characteristics are obvious as discovering the optimum or workable ranges involve only routine skill in the art, the general conditions being disclosed in the prior art. In re Aller, 105 USPQ 233 is cited for authority.

Applicants respectfully disagree.

There is no teaching as to the relationship between the inner surface of the innermost belt (4e) and the saddle face of the elements (5).

Even if the inner surface of the innermost belt is made the same as the other belts (4d-4a), that is, the inner surface is the same coarseness for all the belts, there is no teaching that it is advantageous to control the inner surface coarseness with respect to the saddle face of the elements. Absent any such teaching, the inner surface coarseness of the innermost belt (4e) would be the same as the inner surface of the other belts (4d-4a).

Again, both references teach the general condition of the interaction/friction between adjacent bands in the carrier. Neither reference teaches optimizing the interaction/friction between the inner surface of the innermost band and the saddle of the elements. Further, neither reference teaches the means (increasing surface roughness) or workable range for the interaction between the inner surface of the innermost band and the saddle of the elements.

Absent any such teaching, the prior art would teach away from the present invention.

It is well known that increasing the surface roughness typically also increases friction losses and wear, which is quite opposite what one of skill would normally seek or desire. Such common general knowledge would thus deter one of skill from applying the presently claimed relatively high surface roughness value in the frictional contact between the radially inner surface of the carrier and the transverse elements.

Without the disclosure of the present application, there

is no reason one of skill would deviate from the known roughness values of HENDRIKS. Accordingly, the claims are believed to be non-obvious.

Reconsideration and allowance of all the pending claims are respectfully requested.

Other Remarks

On page 5 of the Official Action, it was noted that claim 15 does not recite that the inner surface of the innermost belts has retaining grooves. This is correct. Applicants are not arguing that "the prior art fails to teach that the innermost surface having a surface profile providing with oil retaining grooves". Indeed, the assignee of this application is the major manufacturer of the present type of driving belt and is aware of the use of surface profiling.

If the claims are not deemed to be non-obvious, entry of this amendment is solicited since this amendment is only formal in nature and the amendment places the case in better form for appeal.

Applicants believe that the present application is in condition for allowance and an early indication of the same is respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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REL/lrs

APPENDIX:

The Appendix contains the following item:

- page 893 of the ASM handbook, Volume 18; and
- pages 102-103 of Principles and Applications of Tribolgy (cover and copyright page also included).

Annex I

MV megavolt
M_v bearing friction torque due to hydrodynamic fluid friction
n pinion speed; load life exponent (experimentally based, with consensus values published in the bearing standards; typically, $n = 3$ for ball bearings and $n = 10/3$ for roller bearings); number of triangles in regular polygon; independent contact points conducting in parallel; bearing speed
N newton
N number of cycles; normal solution; angular velocity of cylindrical contact; bearing speed; normal force
NA numerical aperture
NASA National Aeronautics and Space Administration
NBS National Bureau of Standards (former name of NIST)
NDE nondestructive evaluation
NER erosion resistance number
n_i inner ring speed
NIST National Institute of Standards and Technology
nm nanometer
n_m cage speed (rolling-element orbital speed)
NMMA National Marine Manufacturers Association
n_o outer ring speed
No. number
N_0 rationalized incubation period
NOR incubation resistance number
NPSH net positive suction head
NPSHA available net positive suction head
NPSHR required net positive suction head
n_{RE} ball or roller speed about its own axis
ns nanosecond
NSp not specified
$N(\Lambda)/N_{cal}$ relative life factor
$N_{\mu e=0}$ fatigue life when surface traction equals zero
Oe oersted
OECD Organisation for Economic Cooperation and Development
OFD oxyfuel detonation (spray)
OFP oxyfuel powder (spray)
OFW oxyfuel wire (spray)
OMCVD organo-metallic chemical vapor deposition
ORNL Oak Ridge National Laboratory
OSHA Occupational Safety and Health Administration
oz ounce
p page
p pressure; hydrostatic pressure acting on the surface
p^* local asperity contact pressure; equilibrium vapor pressure at an evaporant surface
$\bar{p}$ average (bulk) hydrodynamic pressure
P pearlite
P specific load or unit load; pressure; transmitted power
P_a absolute ambient pressure
$\bar{p}_a$ average (bulk) asperity contact pressure
Pa pascal
PA plasma arc (spray); prealloyed; polyamide
PACVD plasma-assisted chemical vapor deposition
PAN polyacrylonitrile
PAO polyalphaolefin
PAPVD plasma-assisted physical vapor deposition
PBT polybutylene terephthalate
PCD polycrystalline diamond
PCV positive crankcase ventilator
PDF probability density function
Pe Péclet number
PEEK polyetheretherketone
PEI polyetherimide
PEK polyetherketone
PEP passive extreme pressure
PES polyether sulfone
PETN pentaerithritol tetranitrate
PETP polyethylene terephthalate
PFPE polyperfluoroalkylether
pH negative logarithm of hydrogen-ion activity
p_H maximum Hertzian contact pressure
PH precipitation hardenable
P_H hardness; Brinell pressure
PHL plastohydrodynamic lubrication
p_i pocket pressure in hydrostatic bearing
PKA primary knock-on atom
PLP percent of large particles
p_m flow pressure or hardness of material
PM permanent mold
P/M powder metallurgy
PMMA polymethyl methacrylate
P_N nominal normal stress on contact patch
p_0 yield pressure
POD pin on disk
POF pin on flat
POM polyoxymethylene
P_{or} static equivalent radial load
POR pin sliding against the cylindrical surface of a rotating ring
ppb parts per billion
ppba parts per billion atomic
ppm parts per million
ppmm parts per million by mass
PPS polyphenylene sulfide
ppt parts per trillion
PSD power spectral density
psi pounds per square inch
psia pounds per square inch absolute
psig gage pressure (pressure relative to ambient pressure) in pounds per square inch
PSII plasma-source ion implantation
PSZ partially stabilized zirconia
PTA plasma transferred arc
PTFE polytetrafluoroethylene
P_u fatigue load limit
PVC polyvinyl chloride
PVD physical vapor deposition
PVDF polyvinylidene-difluoride
q heat flux distribution; oil flow rate
Q thermal energy generated per unit time
q_{av} average heat flux distribution
$\bar{Q}_c$ contact stress
Q_{gen} heat generation
Q_i rate of heat supplied to body i
r radius; radial distance of receiver from source; resistivity
R roentgen
R radius; gas constant; reliability expressed in terms of percent survival; resistance
R force vector
r_0 relative radius at an area before wear
R_0 surface radius with lubricant film
r_1 radius of surface 1 at area before wear
r_2 radius of surface 2 at area before wear
r_I radius of rolling body I
~~r_{II} radius of rolling body II~~
R_a surface roughness in terms of arithmetic average
~~*RA* reduction in area~~
r_B bushing radius
RB reaction bonded
RCF rolling contact fatigue
RCW rolling contact wear
RDX cyclotrimethylene trinitramine
R_e equivalent radius of curvature; rationed erosion rate
RE rare earth
Ref reference
REF relative erosion factor
rf radio frequency
RH relative humidity
RIP reactive ion plating
rms root mean square
R_n neutral radius
R_p single predominant peak height; leveling depth
rpm revolutions per minute
R_{pm} mean height of highest peaks on five adjacent sampling lengths; average leveling depth
RPOF reciprocating pin on flat
R_q rms (root mean square) roughness
R & O rust and oxidation inhibited
r_s shaft radius
RS reactive sputtering
R_{sk} skew roughness
RSOF reciprocating, spherically ended pin on a flat surface

Annex II a

PRINCIPLES AND APPLICATIONS OF TRIBOLOGY

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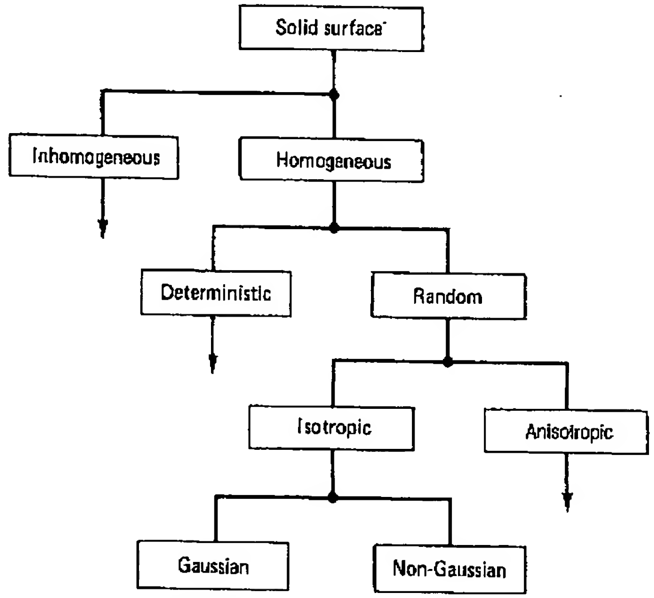

Fig. 3.3.2 General typology of surfaces.

3.3.1 Average Roughness Parameters

3.3.1.1 Amplitude Parameters Surface roughness most commonly refers to the variations in the height of the surface relative to a reference plane. It is measured either along a single line profile or along a set of parallel line profiles (surface maps). It is usually characterized by one of the two statistical height descriptors advocated by the American National Standards Institute (ANSI) and the International Standardization Organization (ISO) (Anonymous, 1975, 1985). These are (1) R_a, CLA (center-line average), or AA (arithmetic average) and (2) the standard deviation or variance (σ), R_q or root mean square (RMS). Two other statistical height descriptors are skewness (Sk) and kurtosis (K); these are rarely used. Another measure of surface roughness is a extreme-value height descriptor (Anonymous, 1975, 1985) R_t (or R_y, R_{max}, or maximum peak-to-valley height or simply P–V distance). Four other extreme-value height descriptors in limited use, are: R_p (maximum peak height, maximum peak-to-mean height or simply P–M distance); R_v (maximum valley depth or mean-to-lowest valley height); R_z (average peak-to-valley height) and R_{pm} (average peak-to-mean height).

We consider a profile, $z(x)$, in which profile heights are measured from a reference line, Fig. 3.3.3. We define a center line or mean line as the line such that the area between the profile and the mean line above the line is equal to that below the mean line. R_a, CLA or AA is the arithmetic mean of the

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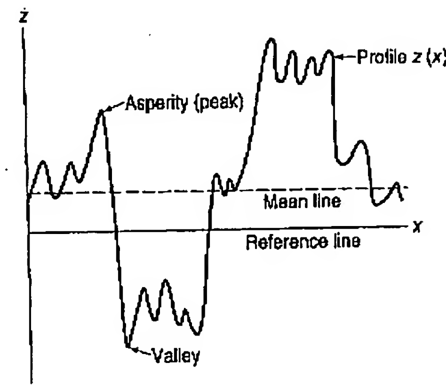

Fig. 3.3.3 Schematic of a surface profile z(x).

absolute values of vertical deviation from the mean line through the profile. The standard deviation σ is the square root of the arithmetic mean of the square of the vertical deviation from the mean line.

In mathematical form, we write

$$R_a = CLA = AA = \frac{1}{L}\int_0^L |z - m|\, dx, \qquad (3.3.1a)$$

and

$$m = \frac{1}{L}\int_0^L z\, dx, \qquad (3.3.1b)$$

where L is the sampling length of the profile (profile length).

The variance is given as

$$\sigma^2 = \frac{1}{L}\int_0^L (z-m)^2 dx \qquad (3.3.2a)$$

$$= R_q^2 - m^2, \qquad (3.3.2b)$$

where, σ is the standard deviation and R_q is the square root of the arithmetic mean of the square of the vertical deviation from a reference line, or

$$R_q^2 = RMS^2 = \frac{1}{L}\int_0^L (z^2)\, dx \qquad (3.3.3a)$$

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